Q.P. FORM 18-1.2
DATE 8-4-81

Commonwealth Edison Company

QUALITY ASSURANCE MANUAL

AUDIT REPORT

Type Audit: [X] Program Audit [ ] Product Inspection Point

[ ] Records [X] Special (Design Analysis)

To: D. L. Leone

Project LaSalle Visit Date 6/7-11/82 Report Date 6/17/82

System Byron/Braidwood Various Component Identification N/A

Material Description N/A

Vendor Sargent & Lundy Location 55 East Monroe Chicago, IL 60603

Subcontractor _____ Location _____

Contacts See "Attachment D"

P.O. No. -- Spec. No. --

Recommended Inspections: 6 mos 3 mos 1 mo

Other: _____

Notes: Sargent and Lundy is requested to respond in writing by July 16, 1982 to G. F. Marcus, Director of Quality Assurance.

Auditor _____ Date _____

Reviewed G. F. Marcus Date 6/17/82

cc: Manager of QA
Exec. V.P.
V.P. (Nuclear Operations)
Assistant V.P.
Manager of Projects
Station Nucl. Engr. Mgr.
R. J. Mazza - S&L
H. S. Taylor - S&L
Site Quality Assurance
Project Manager
Project Engineering Mgr. (Stephenson/Schlosser)
(List others as required)
Auditee
J. D. Deress
B. R. Shelton
R. N. Ferguson
R. J. Harris

COMMONWEALTH EDISON COMPANY
GENERAL OFFICE QUALITY ASSURANCE DEPARTMENT

AUDIT OF SARGENT & LUNDY CORPORATE OFFICE
June 7-11, 1982

I. SCOPE

The General Office Quality Assurance Departmment conducted an audit of the Sargent & Lundy corporate office at 55 East Monroe, Chicago, Illinois, during the period June 7-11, 1982. The audit covered implementation of the S&L Quality Assurance Program and an evaluation of the adequacy of the mechanical, electrical and structural design of LaSalle Unit Two and the Byron/Braidwood units. The audit team consisted of the following personnel:

NAME	AREA AUDITED	AUDIT TEAM POSITION
M. A. Gorski	Mechanical/Structural Design	Auditor
B. E. Harl	Q. A. Program	Auditor
E. L. Martin	Q. A. Program	Auditor
A. M. Montalto	Pipe Support Calculations	Auditor
T. R. Sommerfield	Electrical Design	Auditor
M. A. Stanish	Administrative Controls	Auditor
G. F. Marcus	-------	Team Leader
W. J. Shewski	-------	Mgmt. Observer

II. DEFICIENCIES

The audit team identified three (3) findings and five (5) observations. The details of these items are included in Exhibit "A" and the items are briefly summarized as follows:

CLOSED 9/24/82
F1 A
F1 B 10/24/82

FINDING #1 - In the Byron/Braidwood group, drawings which have been revised to reflect FCR's have been found to have errors and were reported by the site to S&L but minimal action has been taken to correct the drawing errors. Also, the S&L Quality Control Division has not adequately resolved off-site vendor procedure discrepancies.

CLOSED 9/24/82 FINDING #2 - The Byron/Braidwood group has used interoffice memos to implement design criteria changes for the routing of triaxial instrumentation cables.

CLOSED 11/29/82 FINDING #3 - For Byron/Braidwood, no provision was made for local annunciation and alarms for fire protection in the battery room.

OBSERVATION #1 - In the Byron/Braidwood group, administrative controls have not been established to ensure that concrete test data and reinforcement-bar damage data are controlled to ensure accountability of all information required to provide an adequate basis for final design review.

2A CLOSED 9/24/82 2B OBSERVATION #2 - CECo and off-site vendor NCR's have not been processed in a timely manner.

CLOSED 12/26/82 OBSERVATION #3 - Authority has not been designated to S&L General Office personnel to provide advance verbal concurrence for FCR's.

CLOSED 9/24/82 OBSERVATION #4 - In certain cases, S&L audit checklists did not contain adequate objective evidence.

CLOSED 9/24/82 OBSERVATION #5 - Two Byron/Braidwood Project Instruction books did not contain all of the latest revisions to the Project Instructions.

In addition to the above eight deficiencies, two points were noted by the audit team which require further explanation. CECo is requesting further information for these items and has listed them as comments as follows:

CLOSED 11/29/82 COMMENT #1 - Notifications of revisions to the S&L Quality Assurance Manual have not been issued in accordance with the expected issue date listed on the notification.

CLOSED 9/24/82 COMMENT #2 - S&L electrical standards have not been reviewed every five years as required.

III. SUMMARY AND ASSESSMENT

In general, the audit team concluded that Sargent & Lundy has done an excellent job in implementing their Quality Assurance Program. The number of deficiencies identified during the audit were minimal. This is

especially significant because the audit team performed an in-depth analysis in each of the areas audited and expended approximately 200 man-hours performing the audit of S&L personnel and records. In addition, it was determined that Sargent & Lundy has properly followed applicable procedures, standards, criteria, codes, regulatory commitments and design controls to achieve adequate designs in the mechanical, structural and electrical areas for LaSalle, Byron and Braidwood. A more detailed summary and assessment of each major area audited is as follows:

ADMINISTRATION - The areas reviewed during this portion of the audit were administrative controls and practices at the S&L general office for both the LaSalle and Byron/Braidwood project groups.

A major emphasis of the audit was placed on control, processing and accountability of the following documents: FCR's, CECo and off-site vendor NCR's, on-site and off-site vendor procedures, concrete cylinder test reports and concrete expansion anchor rebar hit reports. For each of the documents listed a review was made to determine if S&L had adequate controls in place to account for all documents generated at the site and transmitted to S&L. Controls appeared to be adequate for the LaSalle project group but several problems were found in the Byron/Braidwood project group. Deficiencies, in varying degrees, were identified for tracking FCR/Drawing Error Letters, off-site vendor procedures, concrete cylinder break test reports, concrete expansion anchor rebar hit reports and on-site and off-site vendor procedures. These deficiencies are detailed in the summary of findings and observations.

Emphasis was also placed on the S&L audit program. A review was made to determine the adequacy of the S&L audit program coverage in the following areas: computer programs, FCR processing, CEA rebar hit concerns, site activities and QC review of vendor procedures. From the data reviewed, all areas appeared to be covered.

Design controls were reviewed to assure adequate interface between piping and hanger design groups. Hanger revisions were also reviewed to assure that hanger numbering systems are maintained. Both areas appeared acceptable. One design control concern was noted in the area of FCR's. It was found that specific personnel at the S&L general office are not delegated the responsibility to give advance verbal concurrence on FCR's. This is considered an observation and is detailed in the summary of findings and observations.

A review was also made of selected specification requirements to determine S&L compliance to such requirements. Requirements delineated in S&L specification F/L-2741 were reviewed. In all areas reviewed, S&L was in compliance with requirements, including procedure review, documentation review, drawing review and establishment of an inspection point program.

Records for contract personnel employed by S&L for LaSalle, Byron and Braidwood were reviewed to assure education and previous employment has been verified. In all cases, adequate verification was found.

Finally, a review was made to assure that problems identified by NRC on one project are reviewed by other project personnel. S&L has adequate systems of communication through metings and correspondence to assure information is exchanged between projects and reviewed by Project Personnel.

The results of this portion of the audit indicate that S&L is adequately implementing their QA program. However, there were several weaknesses identified in the area of accountability and processing of site generated documents transmitted to S&L for their disposition. It may be noted also, that most of the four problems were found in the Byron/Braidwood project group. It appears that more attention should be given to this area to assure accurate accountability of such documents. In general, however, the administrative controls at S&L are adequate.

MECHANICAL/STRUCTURAL DESIGN - This portion of the audit centered on verifying that specific technical FSAR requirements were included in the structural and mechanical design for the LaSalle and Byron/Braidwood projects. The following items were verified:

1. Stress Analysis - S&L Engineering Mechanics Division
   - Mode combination technique
   - Reaction combination technique
   - Load case combinations
   - Allowable piping stresses used
   - Seismic analysis of systems subject to more than one response spectra
   - Valve modeling

2. Equipment Qualification - S&L Component Quality Division
   - Stress analysis and seismic qualification of active pumps and valves

3. Structural Design - S&L Structural Division
   - Proper load combinations and allowable stresses for both structural steel and reinforced concrete design

In all areas reviewed, it appeared that FSAR technical requirements were being met. Design calculation and other design documents were clearly arranged, legible and readily retrievable. Personnel interviewed during the audit appeared to be knowledgeable in the technical aspects of the design and were familiar with both the FSAR requirements and the various S&L design standards and instrutions used to implement the FSAR requirement.

PIPE SUPPORT CALCULATIONS - Byron/Braidwood Units I and II and LaSalle's Unit II large bore component support design calculations were reviewed to assure that they included the following specific design requirements. The auxiliary structural steel is checked for simple deflection. The auxiliary steel is assigned within its allowable capacity. A weld check evaluation that includes the minimum requirements of the AISC Manual as well as a capacity check is performed as applicable. Design criteria such as the appropriate acceleration factors, applicable load safety factors, misalignment tolerances, location tolerances and the correct loads from the current stress analysis are used. When in place structural steel is used for a point of attachment it is checked for stiffner requirements.

Several component support design calculations from both jobs were reviewed and are included in the objective evidence for this audit. This review consisted of the technical requirements stated above, a verification of an independent review of those calculations and an occasional arithmetic check, except for isolated cases noted below, the calculations reviewed properly included the design requirements and the arithmetic reviewed was found to be correct. One component support design calculation from Byron/Braidwood did not include a deflection check of the auxiliary structural steel. One calculation from the LaSalle job did not document the qualification of 1 1/2" U-bolt assigned to the support. These items identified during the audit are considered to be isolated occurrences. In addition both items were corrected during the course of the audit.

Based on the numerous amount of calculations reviewed and the minimum amount of deficiencies identified it is apparent that S&L personnel are adequately performing design calculation that qualify component supports for all three sites.

ELECTRICAL DESIGN - During the audit of the electrical design of Byron/Braidwood, the following areas were reviewed:

1. Qualification of valve operators, penetrations, motors and cables to various IEEE Standards
2. Cable failure analysis
3. Separation of penetration ESF divisions
4. Routing of nuclear instrumentation cables
5. Battery and battery charger sizing
6. Redundancy of DC feeders
7. ESF divisional separation of DC circuits
8. Class 1E 4160v switchgear protection and sizing
9. Diesel generator start controls
10. Class 1E circuit separation in control boards
11. Fire suppression systems
12. Fire detection systems

For the LaSalle project the following areas were reviewed:

1. ESF divisional separation of DC circuits
2. Battery sizing
3. Fire suppression systems
4. Fire detection systems
5. Class 1E 4160v switchgear sizing

Except for the deficiencies found in the areas of fire detection and triaxial cable routing, it appears that the Electrical Project Groups have adequately translated FSAR commitments into the procurement specifications and the fabrication drawings. In addition, it appears that the Project Groups are performing an adequate review to assure that procured electrical equipment meets applicable standards. Clear understanding and sound technical knowledge was exhibited by all personnel contacted in the Electrical Project Groups.

Q.A. PROGRAM - During the audit, implementation of the Sargent & Lundy Quality Assurance Manual was reviewed in the below listed areas with the following results:

1. Organization Manuals, Positions and Description Manuals were found to be current and up-to-date. Additionally, Employee Qualification statements were reviewed in the Mechanical, Electrical and Structural Design areas and were found to be in excellent shape.

2. The control and issuance of S&L Quality Assurance Manuals was reviewed as was the S&L review of Client's Quality Assurance Manuals. Both areas appeared to be organized and current.

3. Files of recent and superseded Codes and Standards retained in the library were found to be orderly and properly maintained.

4. Master lists, drawing lists, specification lists, ECN status lists and Project distribution lists were being issued as required in a timely manner.

5. Both departmental and project training programs indicated that their respective requirements were being adequately implemented.

6. The management audit and report were found to be adequate.

7. Project specifications were being properly reviewed with comments being properly incorporated.

8. The area of corrective action was found to be organized, timely and effective.

9. QA records were found to be uniform and up-to-date.

10. The internal/external audit program appeared to cover all quality related areas in a timely manner by personnel who are properly qualified. There appears to be a good, timely follow-up system.

Based on the documentation reviewed during four days of auditing, Sargent & Lundy is effectively implementing their Quality Assurance Manual.

IV. REMARKS

Also included as part of this report are four Exhibits. Exhibit A - Summary of Findings and Observations; Exhibit B - Attendance, Pre-Audit Conference; Exhibit C - Attendance, Post-Audit Conference: Exhibit D - Personnel Contacted During the Audit.

A written response to the findings, observations and comments in this report are requested by July 16, 1982. The response should describe the corrective action, action to prevent recurrence and expected date of completion. The response should be directed to Mr. George F. Marcus, Director of Quality Assurance, with a copy to Mr. W. J. Shewski, Manager of Quality Assurance. Please direct any questions regarding this audit to the undersigned.

The audit team members sincerely appreciate the attentions and cooperation extended by the Sargent & Lundy management and personnel throughout the audit.

G. F. Marcus.

George F. Marcus
Audit Team Leader

cc: Mr. W. J. Shewski

EXHIBIT A

COMMONWEALTH EDISON COMPANY
QUALITY ASSURANCE DEPARTMENT AUDIT OF
SARGENT & LUNDY

FINDING #1

10CFR50, Appendix B, Criterion III states in part; measures shall be established to assure that requirements are correctly translated into specifications, drawings, procedures and instructions.

Contrary to this, in the BY/BR group, design requirements have not been translated into drawings and procedures in a timely manner.

Discussion:

Two examples of the failure to meet the above requirements are as follows:

A. FCR deficiency letters used to transmit FCR's for which discrepancies have been found by Byron site personnel between the FCR and subsequent drawing revisions have not been processed by S&L as of 6/1/82. Twenty-three (23) deficiency letters have been transmitted to S&L for correction of deficiencies but less than ten percent (10%) have been logged. Many letters have been received but are not yet logged. In addition, only one (1) discrepancy letter has been responded to by S&L at this time (Discrepancy letter #1 dated 2/23/82). This system was begun in February 1982. Also no log has yet been established for deficiencies identified on FCR's initiated at Braidwood Station.

B. S&L Quality Control Division has not adequately resolved procedure discrepancies with off-site vendors. This is evidenced by one hundred seventy-six (176) procedures submitted by off-site vendors which have not yet been indicated as status #1 (reviewed and accepted). Many of the procedures are presently status #2 (revise as noted and resubmit, contractor may proceed based on making revisions noted) or status #4 (results do not meet specification requirements). As an example, procedure #ATP 71736 from S&L specification F/L 2794.1 has been at status level #4 since 12/17/76. In addition, during the audit it could not be demonstrated that follow-up has been performed by S&L QC via a letter to the appropriate vendor requesting resubmittal of required procedures.

FINDING #2

10CFR50, Appendix B, Criteria VI, states that "measures shall be established to control the issuance of documents, such as instruction, procedures, and drawings, including changes thereto.... These measures shall assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel.... changes to documents shall be reviewed and approved by the same organizations that performed the original review and approval...." Contrary to this requirement, S&L has utilized interoffice memorandums in lieu of approved procedures to effect design criteria changes. These changes were not reviewed, issued and approved in accordance with QA requirements.

Discussion:

The Byron/Braidwood FSAR, page 8.3-18, states that nuclear instrumentation signal (triaxial) cables will be run in steel conduit that is limited to 25% fill, and that the maximum straight run of conduit is 100 feet or where a 90 degree bend occurs that the straight run is 10 feet maximum. S&L Design Criteria #DC-EE-01-BB, Revision 8, also states the same criteria. On 1/26/82 an interoffice memo was sent from the Byron/Braidwood Electrical Project Group to the Electrical Design & Drafting - Physical Section stating that the above requirements were no longer applicable. Further investigation indicated that this change to the FSAR had not been forwarded to the Nuclear Safeguards & Licensing Division (NSLD) for incorporation. Also the S&L Design Criteria DC-EE-01-BB, has not been reviewed, approved and issued to reflect the changes made in the memorandum.

FINDING #3

The Byron/Braidwood Fire Protection Report, page 2.3-47, states that ionization detectors are to be provided in the battery room which annunciate and alarm locally and in the control room. Contrary to this commitment there was no evidence to show that local annunciation and alarms have been provided for in the battery rooms.

Discussion:

Review of various S&L design drawings indicated that the ionization detectors located in the station's battery room annunciate and alarm in the main control. However, no provisions have been made to provide annunciation and alarms in the battery rooms themselves.

OBSERVATION #1

10CFR50, Appendix B, Criterion III states in part, "design control measures shall provide for verifying or checking the adequacy of design."

Contrary to this, for the Byron/Braidwood group measures have not been established to assure that the required information has been used in the final design.

Discussion:

Two examples of the failure to meet the above requirements are as follows:

A. For concrete cylinder break test reports transmitted to S&L by the Byron and Braidwood sites, there are no adequate controls in place to assure that all concrete sample information reports and concrete cylinder break test reports (PTL form #SC-1 and SC-2) have been taken into account in the statistical analysis and evaluation of field concrete performed by S&L of field placed concrete. No means has been established by S&L to assure that all required information has been transmitted or that all information transmitted has been incorporated into the analyses performed.

B. For concrete expansion anchor hit rebar reports transmitted from the Byron and Braidwood site, S&L does not have a system in place to assure that all required information has been received and properly logged. As reports are received from the site they are reviewed for applicability as a cut rebar report and if applicable, logged by drawing number. However, there is no system in place to provide for accountability of all such reports generated at the Byron and Braidwood sites.

OBSERVATION #2

10CFR50, Appendix B, Criterion XVI states in part, "measures shall be established to assure that nonconformances are promptly identified and corrected."

Contrary to this requirement, CECo NCR's and off-site vendor NCR's have not been processed by S&L in a timely manner.

Discussion:

Two examples of failure to process NCR's in a timely manner are as follows:

A. For CECo NCR's it was found that five (5) NCR's identified at Braidwood (L-252, L-263, L-267, L-288, and L-290) and five (5) NCR's identified at Byron (F-492, F-493, F-526, F-545, and F-565) have been at S&L for disposition for a period greater than one (1) year. In addition, the following NCR's have been at S&L for disposition for between sixty (60) days and one(1) year: F-678, F-686, F-689, F-693, F-694, F-695, F-698, and F-699.

B. For off-site vendor NCR's, it appears that several NCR's submitted to S&L as long as five (5) years ago have not yet been dispositioned. As an example, for specification F/L 2725, NCR #RAD #5 received for disposition 3/30/78 and NCR #RAD #8 received for disposition 4/8/77 have not been dispositioned by S&L. The above findings were made based on a review of the S&L off-site vendor NCR log.

OBSERVATION #3

S&L project instruction PI-BB-13, Rev. 4, dated 3/22/82 states in section 2.11, "personnel providing preliminary approval for FCR's shall be designated."

Further, section 4.0 states, "information or direction communicated verbally or communicated by one person and/or information or direction given prior to revision of the affected design documents (advance verbal concurrence) constitutes preliminary approval."

Contrary to this, personnel who provide advance verbal concurrence from the S&L general office for Byron and Braidwood projects have not been designated.

Discussion:

A memo dated 3/22/82 from W. Cleff has delegated the responsibility to give preliminary approval of FCR's to specific individuals located at the Byron site, however, no personnel from the S&L general office providing advance verbal concurrence have been designated.

In addition, although BI-BB-13 pertains only to the Byron and Braidwood projects, it was found that no designation of personnel has been made for the LaSalle group at the general office as well.

OBSERVATION #4

GQ-18.01 requires that documents examined during an audit are properly identified on the approved audit checklist. Contrary to this requirement, on some S&L audit checklists objective evidence was found to be unclear.

Discussion:

A review of ninety (90) randomly selected audit checklist questions indicated that the objective evidence for forty-one (41) questions was not obvious and could not be determined without making certain assumptions. For questions marked non-applicable on the following checklists, the justification was unclear:

Audit No.	Question
B-B-46	3e
B-B-47	3 to 5, 7 to 9c, 28, 33, 37, 38, 43
B-B-55	1, 2a, b, c, 3a, b, c, d, e, 4 to 14
LS-57	3p, q, 8, 9, 12, 13q, r, 14, 16, 18 to 21, 33

OBSERVATION #5

S&L Quality Procedure G.Q.-5.01, Revision 2, states that the recipients of project instructions shall maintain a book of all the projects current instructions and the updated index. Contrary to this requirement, two (2) Byron/Braidwood Project Instruction books reviewed did not have all the latest revisions.

Discussion:

A review of five (5) Byron/Braidwood Project Instruction books verified that two (2) of the books did not have DJ-BB-02 dated 11-5-76 as listed on the index. Upon notification of the deficiency, the book holders updated their instruction books prior to this audit exit.

Comment #1 Notification of revisions to the S&L Quality Assurance Manual have not been issued as indicated on the notification.

Discussion: The following notifications were issued as noted for GQ-3.06:

Number	Issue Date
050	1-4-79
053	4-4-79

In both cases, the expected issue date of new revision to the procedure was June 1979. The latest revision to Procedure G.Q. 3.06 "Sargent & Lundy Standards" is Revison 1 dated 7-30-76.

Comment #2 Sargent & Lundy Electrical Standards have not been reviewed every five years.

Discussion: S&L Procedure GQ-3.06, Revision 1, states S&L Standards shall be reviewed at least every five (5) years or as required by changes in government or industry codes and standards." A review of the Electrical Standards revealed the below listed standards as exceeding the five (5) years:

Standard	Date on Standard
ESA 104a	12-11-75
ESA 115	6-1-36
ESA 121	6-24-52
ESA 154	11-18-68
ESA 156	5-20-52
ESC 154	4-16-74
ESC 165	2-28-75
ESC 172	3-19-62
ESC 173	11-5-76

Sargent & Lundy has conducted audits in the area of standards review. Audit G135 dated 1-28-82 currently has an outstanding Corrective Action Report (CAR) with a scheduled date of completion on 8-5-82.

Also audit G-146 dated 5-20-82, not approved for issue to date, verified that problems were encountered in the area of Electrical standards. To date a CAR has not been issued, however, the proposed plan of corrective action for the Electrical Department to meet the QA requirements of reviewing department standards every five years is outlined in the R. H. Sadlowski interoffice memorandum dated June 8, 1982. It was stated that a CAR will be issed when the auditor returns from sick leave.

EXHIBIT B

COMMONWEALTH EDISON COMPANY
QUALITY ASSURANCE DEPARTMENT
AUDIT OF SARGENT & LUNDY

Purpose: Pre-Audit Conference
Date: June 7, 1982
Place: Sargent & Lundy Corporate Office
Room 30P30
Time: 8:30 a.m.

NAME	TITLE	COMPANY
W. J. Shewski	Mgr. of QA	CECo
G. F. Marcus	Director of QA Eng./Const.	CECo
T. R. Sommerfield	QA Supt./Braidwood	CECo
M. A. Gorski	QA Engineer	CECo
E. L. Martin	QA Coordinator	CECo
M. A. Stanish	QA Supt./Byron	CECo
B. E. Harl	QA Supv. - Zion	CECo
A. M. Montalto	QA Engineer	CECo
M. Schuster	Head, Quality Control Division	S&L
W. S. Chittenden	Dir. of Engineering	S&L
R. X. French	Mgr. Elect. Dept.	S&L
W. C. Cleff	Project Manager	S&L
H. S. Taylor	Head, QA Division	S&L
S. D. Killian	Project Engineer	S&L
B. G. Treece	SEPE, Byron/Braidwood	S&L
D. L. Leone	Project Director	S&L
R. Rabin	Sr. QA Coordinator	S&L
G. C. Kuhlman	Asst. Mgr. Mech. Dept.	S&L
L. E. Ackmann	Dir. of Services	S&L
W. G. Hegener	Asst. Dir. of Engineering	S&L
R. N. Ferguson	President	Ferguson, Inc.
R. J. Harris	Director, System Engr.	Energy, Inc.
R. N. Curran	Principal Electrical Engineer	Energy, Inc.

EXHIBIT C

COMMONWEALTH EDISON COMPANY
QUALITY ASSURANCE DEPARTMENT
AUDIT OF SARGENT & LUNDY

Purpose: Post Audit Conference
Date: June 11, 1982
Place: Sargent & Lundy Corporate Office
Board Room - 31st Floor
Time: 1:30 a.m.

NAME	TITLE	COMPANY
T. E. Watts	Project Engineer	CECo
M. A. Stanish	QA Supt. Byron	CECo
T. R. Sommerfield	QA Supt. Braidwood	CECo
W. J. Shewski	Manager of QA	CECo
G. F. Marcus	Director of QA (Eng./Const.)	CECo
E. L. Martin	QA Coord./SNED	CECo
A. M. Montalto	QA Inspector	CECo
M. A. Gorski	QA Engineer	CECo
J. Bitel	Staff/SNED	CECo
H. S. Taylor	Head, QA Division	S&L
C. M. Chiappetta	Asst. Mgr. Elect. Dept.	S&L
J. M. McLaughlin	Mgr. Struct. Dept.	S&L
E. R. Weaver	Sr. Struct. Proj. Engr.	S&L
W. A. Chittenden	Director of Engineering	S&L
C. A. Riebel	Project Coordinator	S&L
B. R. Parduhn	Mech. Project Engineer	S&L
V. B. Naschansky	EPED-Project Engineer	S&L
K. J. Green	Mech. Project Engineer	S&L
J. D. Regan	Elect. Engineer (Byron)	S&L
D. L. Leone	Project Director	S&L
R. Rabin	Sr. QA Coordinator	S&L
R. W. Hooks	Asst. Div. Head, Struct. Engineering Div.	S&L
L. P. Dolder	QA Coordinator	S&L
R. Pollock	MPE	S&L
W. G. Hegener	Asst. Director of Engineering	S&L
D. C. McClintock	Mgr. of Services Dept.	S&L
V. Reklaitis	SPE	S&L
E. B. Branch	Mech. Design Director	S&L
W. G. Schwartz	Sr. Elect. Proj. Engr.	S&L
H. M. Sroka	Asst. Mech. Dept. Mgr.	S&L
R. J. Harris	Director Engineering	Energy, Inc.
R. N. Curran	Principal Elect. Engr.	Energy, Inc.
R. N. Ferguson	President	Ferguson, Inc.

EXHIBIT D

COMMONWEALTH EDISON COMPANY
QUALITY ASSURANCE DEPARTMENT
AUDIT OF SARGENT & LUNDY

Auditor	S&L Person Contacted During Audit	
	Name	Department
M. A. Gorski	B. Tatosian	EMD
	P. Olson	EMD
	D. L. Leahy	Auditor S&L QA
	A. Pebler	Sr. System Engineer - EMD
	J. Gray	Sr. System Engineer - EMD
	K. Adlon	Project Engineer-CQD
	G. Smolak	Sr. Stuctural Engineer - SPED
	M. Hassaballa	Supervising Engineer - CQD
	B. Gagineni	Project Engineer-CQD
	C. Podczerwinski	Supervising Engineer - EMD
	S. Kazmi	Supervising Engineer - SED
	M. Holmes	SAD
	J. Yamamoto	CSD-ADM
B. E. Harl/E. L. Martin	E. H. Hykan	QAD
	T. D. Hottle	PMD
	C. R. Haake	QAD
	F. Acquaviva	QAD
	H. P. Heisler	Library
	E. R. Crass	NSLD
	T. G. Longlais	SED-S
	C. A. Riebel	PMD
	L. Dolder	QAD
	R. C. Martin	QAD
	T. S. Seredynski	PMD
	S. R. Boeing	NSLD
	R. Rabin	QAD
	R. Salsbury	PMD
	J. E. Szupillo	PMD
	E. R. Weaver	SPED
	J. Gouvas	NSLD
	B. R. Parduhn	PMD

EXHIBIT D (cont'd)

COMMONWEALTH EDISON COMPANY
QUALITY ASSURANCE DEPARTMENT
AUDIT OF SARGENT & LUNDY

Auditor	S&L Person Contacted During Audit Name	Department
B. E. Harl/E. L. Martin (Cont'd)	J. J. Talamo	QAD
	P. Cunningham	QAD
	P. DeBlake	QAD
	A. D. Taylor	EPED
	D. J. Grandys	EPED
	R. J. Small	SPED
	J. S. Estermann	EPED
	S. M. Kazmi	SED-S
	I. Berkovitz	MDDD
	T. B. Thorsell	EPED
	E. Kalest	QAD
	J. Z. Wojcik	MDDD
	W. Rahn	EMD
	S. A. Jaclawi	Wiring
A. Montalto	B. Baer	Byron/Brwd
	R. Hooks	Byron/Brwd
	L. Dolder	Byron/Brwd
	S. M. Kazmi	LaSalle
	L. Meyer	LaSalle
	J. Szydlik	LaSalle
	C. Podczerwinski	LaSalle
	F. Panzica	LaSalle
	P. Patiu	LaSalle
T. R. Sommerfield	D. P. Galanas	EPED
	V. Naschansky	EPED
	T. Thorsell	EPED
	T. R. Eisenbart	EPED
	F. G. Goghatti	EPED
	C. Furlow	EPED
	B. G. Treece	EPED
M. A. Stanish	T. Hottle	PMD
	M. Camba	PMD
	S. Kazmi	LaSalle
	C. Riebel	PMD
	R. Rakowski	PMD
	B. Parduhn	PMD
	R. Kosik	QC
	D. Patel	SED-S

EXHIBIT D (cont'd)

COMMONWEALTH EDISON COMPANY
QUALITY ASSURANCE DEPARTMENT
AUDIT OF SARGENT & LUNDY

Auditor	S&L Person Contacted During Audit	
	Name	Department
M. A. Stanish (Cont'd)	J. Szupillo	PMD
	C. Boelke	Employee Relations
	S. Taylor	QA
	R. Martin	QA
	R. Rabin	QA
	R. Johnson	QA
	R. Hooks	SED-S
	D. Carreira	SPED
	R. Netzel	SPED

nuclear power services, inc.
55 east monroe street
chicago, illinois 60603
312-346-7055

April 8, 1983
NPS-109-83-2311

Mr. D. L. Leone
Project Director
Sargent & Lundy Engineers
55 E. Monroe Street
Chicago, IL 60603

PROJECT: Byron Station Units 1 and 2
Sargent & Lundy's (S&L) Project Nos. 4391/4392-00

SUBJECT: Design Control for Nuclear Power Services (NPS)
Scope of Work on the Byron Project

Dear Mr. Leone:

This letter describes the method of design control employed by NPS in performing its assigned scope of work on the Byron Station.

Scope of Work

NPS's scope of work on the Byron Project includes support design and related calculations for two inch and under Category I and II piping in Auxiliary and Fuel Handling Buildings, Category I piping two inches and under in River Screen House and 2 1/2 to 4 inch Category II piping (under 200° F.) in Auxiliary and Fuel Handling Buildings, Unit 1 and 2. These designs are in accordance with S&L supplied simplified dynamic analysis and flexibility criteria. The technical base of the work performed by NPS is identical to those for the work performed by S&L.

The pipe support designs are analyzed per the requirements and instructions of S&L's "Small Piping and Tubing Procedures". In addition to standard analyses, the pipe support design calculations include auxiliary steel, base plates and self-weight excitation. NPS uses the computer program "GT Strudel", a verified Control Data Corporation program for the static analysis of general structures, and "Base Plate", a verified NPS program for base plate designs, in performing pipe support design calculations.

General

The Byron project technical specification was developed on the basis of the project requirements outlined in S&L's consultant Specification No. 109. Project procedures and the NPS Project Design Manual were developed by an NPS project team, including management, engineering and quality assurance personnel for the use by project personnel. NPS project procedures and the NPS Project Design Manual were reviewed by S&L. The project procedures were approved by S&L as required. In addition, S&L provided technical documents for use by NPS, e.g. S&L Standard Piping Design Tables, S&L Mechanical Components Support Design Reference Manual, and S&L Standard Specifications for Concrete Expansion Anchor Work (BY/BR/CEA).

Organization

Nuclear Power Services, Inc. has a matrix organization, which is employed in performing the work on the Byron project. The Project Manager is responsible for the overall management control. He interfaces with S&L and supervises the Project Engineer and project management staff. A project Quality Assurance Engineer was assigned to the project management staff. The Project Engineer is responsible for the coordination and technical adequacy of the work. He is represented, and is monitored, by the Field Engineering Manager located in our Secaucus office.

The various technical personnel on the project were put into design groups, supervised by a design group leader. Disciplines within the group were supervised by team leaders (e.g. Structural team leader, Mechanical team leader) who were responsible for the technical adequacy and quality of work within the discipline's scope of work. The discipline's team leaders report to the Design group leader, who reports to the Project Engineer.

The Design team leader (mechanical field construction engineer) assists field construction personnel with resolution and implementation of design changes.

Personnel Qualifications

The qualifications of all project technical personnel are verified. The verification is accomplished in accordance with NPS procedure EPP-2. Included in the verification is the confirmation of education, certification by regulatory agencies and employment history.

Personnel assigned to the project by the appropriate technical managers are assigned with the concurrence of the Prject Manager.

Training

Project personnel are trained in corporate and project quality assurance and project technical requirements. The training and indoctrination program includes instructions regarding project procedures and project design manual information.

Training in the use of the NPS issued "Pipe Support Design Manual" which is in accordance with the S&L issued criteria, was provided for all design and engineering personnel. Refresher training is provided whenever project instructions and guidelines are revised.

Technical Coordination

The following activities are used to provide continuing and effective coordination and interface between S&L and NPS. Frequent discussions and consultations about technical concerns are held on an informal basis between S&L project and technical management and the NPS project team. Minutes are taken for the formal meetings held to consider project status and technical requirements. Technical review session are conducted when necessary. S&L technical and administrative documents are provided for NPS use. These documents are incorporated in NPS generated procedures and our "Pipe Support Design Manual", which are reviewed by S&L.

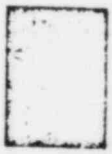
Daily contacts with the S&L site coordinator and the NPS Project Engineer and design team leaders to clarify and design requirements are made via an "RFI" (Request For Information).

Where revisions to technical documents or administrative procedures are made by S&L, they are evaluated by NPS project and engineering management to ascertain their impact on project specifications, procedures and the NPS project design manual. NPS documents are revised, as required, and backfitting is performed where required with S&L approval.

Within each engineering work activity, a three-step "Preparer/Reviewer/Approver" sequence is followed. Each step is performed independently by different persons to insure that the proper work instructions, design inputs and calculation procedures are followed. The Project Engineer signs all designs as "approver" in accordance with his responsibility for technical adequacy and quality. In addition, a Professional Engineer reviews and applies his seal to the design drawings.

Summary of Work Flow

The project work flow is detailed in the NPS Work Procedures, which are reviewed and approved by S&L. The general sequence of work activities is as outlined in NPS Work Procedure No. 3.0.4 (Attachment 1) and 3.0.11 (Attachment II).



Independent Technical Review

Completed work packages for subsystems in the NPS scope of work for S&L Specification Number 109 are selected at random for technical review by an independent group of qualified engineers, who are separate from the Byron project.

The purpose of the review is to determine that the engineering approaches, procedures and guidelines used on the project represent sound engineering practices and meet S&L design criteria.

The scope of the pipe support review includes reviewing analysis using S&L's SDA, auxiliary steel calculations, base plates, welds and expansion anchors.

The review is conducted as part of a QA audit for the NPS procedures. The technical review is reported as part of this audit. The final conculsion of this effort is that reviewed work complies with the applicable design requirement and that there are no apparent procedural errors.

Please do no hesitate to call if you have any comments or questions concerning this letter.

Very truly yours,

NUCLEAR POWER SERVICES, INC.

A. P. Stone
Project Manager

APS/pb

cc: A. J. Moellenbeck
G. Briedenbach
W. C. Cleff

BYRON STATION

I. INTRODUCTION

A. General Conceptive Design Control

Sargent & Lundy (S&L) performs design work for the safety-related portions of a nuclear power plant under an approved Quality Assurance (QA) Program meeting the 10CFR50 Appendix B Criteria. This provides the foundation for addressing design control, document control and auditing. Upon this foundation, S&L adds General Office procedures, Departmental A ministrative Procedures, General Drafting Standards and Departmental Standards to further control and document design activities. The requirements of the QA Program are supplemented by numerous Byron specific Project Instructions which establish detailed procedures covering design activities as well as interdepartmental and interdivisional interfaces.

The Byron project was in the design phase during the years of rapid growth in Nuclear Regulatory Commission Regulatory Guides and Bulletins, and development of the ASME Boiler and Pressure Vessel Code Section III and other Industry Codes. As a consequence, it was recognized by S&L that projects in this time period placed very heavy demands on the design organization to maintain a responsible engineering attitude that would result in creating design controls far more elaborate than might otherwise

A. General Conceptive Design Control (Continued)

be necessary to implement an adequate QA Program. With the increasing complexity of the plant, the size of the design team steadily grew, and thereby added to the importance of design controls that would penetrate the interfaces of this group and assure not only the proper initial design, but the many subsequent revisions to it. The QA Procedures of the S&L company program led to the writing of specific company procedures for each of the mechanical, electrical, and structural disciplines. These laid the ground work to ensure adequate procedures for drawing and document distribution, comment procedures, calculation procedures, etc.

B. S&L Quality Assurance Program

A basic QA program was initiated at S&L in 1971 followed by a formal QA program in 1974. The formal QA program meets the requirements of 10CFR50 Appendix B and was approved by the NRC in 1976. Since 1974, the NRC has conducted 25 generic audits of the S&L QA program. At this time, there are three findings open. There are no open findings on the Byron project.

Since 1974 the S&L QA Division has conducted 71 audits and 58 reaudits of the S&L Byron Project Team. There were 213 findings from these audits; four findings were open as of Feburary 28, 1983. The S&L upper management also conducts an annual audit of the entire S&L QA program.

C. Sargent and Lundy Experience

Sargent and Lundy's experience in engineering all types of generating facilities invited entry into the commercial nuclear power field at the very beginning of its development. Sargent & Lundy was involved in 1955 in the engineering of the world's first commercially related nuclear powered generator installation, a 3000-kW installation at Arco, Idaho. Completed the next year was the 5000-kW Experimental Boiling Water Reactor (EBWR) for Argonne National Laboratory, for which S&L served as architect-engineer (Q/E).

From this pioneering start, S&L's work has continued up to the present day. S&L has served as the A/E on 8 major nuclear units currently in service and is currently the A/E for 9 additional major nuclear units currently in design and construction. Nuclear assignments have included boiling water reactors, pressurized water reactors, a high-temperature gas-cooled reactor (HTGR), and a liquid sodium reactor.

Sargent & Lundy is particularly proud to have been selected as the architect-engineer for a number of "first-of-a-kind" plants, such as the EBWR at Argonne National laboratory, the SEFOR project as SAEA, and the Fort St. Vrain HTGR Nuclear Generating Station of Public Service Company of Colorado.

C. Sargent and Lundy Experience

The current project team at S&L for the Byron Project consists of approximately 600 engineers and designers. Approximately 175 of these engineers and designers are assigned to the Byron construction site. The 9 lead project team management personnel have an average of 11 years nuclear experience and an average of 6 years on the Byron Project.

D. System Design Control

Source documents were developed to address the functional requirements of an operating system to meet both the NRC and NSSS criteria. Through the responsibilities assigned to the various Project Team members, these approved criteria led to the development of drawings, calculations and specifications that in turn lead to the purchase and fabrication of system components.

QA procedures augmented by auditing were intended to assure that proper independent review and approval were part of the design process as the work progressed. Interfaces with vendor organizations were intended to assure that technical requirements were being met.

Design for the Byron Project began in 1971. A majority of the system design was conducted in the 1971-1975 time frame with many revisions taking place since then as a result of changing design requirements, changing NRC requirements, lessons learned from

D. System Design Control (Continued)

TMI, design improvements by S&L, and design changes suggested by Commonwealth Edison Company (CECo) Operating and Engineering Departments. Although an NRC approved QA Program was not in effect until early 1974, normal engineering practices had always been in effect which required review of design work. After implementation of the S&L QA Program in early 1974, work was performed in compliance with these procedures, which ensured that design work was prepared, independently reviewed and approved.

In addition, the design of the various systems has been further reviewed by S&L in the process of responding to the NRC review of the Final Safety Analysis Report (FSAR).

Finally, as a further design verification, S&L has performed independent design reviews. System and structures design reviews were performed for the Byron Project in accordance with applicable QA Procedures and Project Instructions. Design Review Teams of qualified design people not involved with the project design were used. In addition, an overall design review of the Byron design is in process and is being performed by independent senior S&L design personnel in accordance with an applicable Project Instruction. In both types of independent review, documented design review reports are issued and are audited for acceptability.

D. System Design Control (Continued)

After completion of the design process of the operating systems under the design controls described above, Preoperational Test procedure outlines were written. These procedures were written to define the operating modes required of the system and the design parameters and acceptable ranges for each. The test procedure outlines were expanded into detailed procedures by CECo's Operating Department.

It is well known that a good design control program concerns itself with assuring that the individual steps of the design control process are reviewed and approved as the system design progresses, thereby assuring the correctness of the completed design. It is also recognized that when preoperational and/or start-up tests can be performed on functional systems, the system has the opportunity to demonstrate that it can meet its intended design capability, including very detailed electrical and instrumentation design characteristics. This demonstration provides a strong verification that the detailed system functional design was implemented correctly, independently of the design control reviews that were performed.

II. DESIGN CONTROL OF SEISMIC RESPONSE SPECTRA

Seismic response spectra are provided by Sargent & Lundy for use on the Byron Project. The Response Spectra Design Criteria (DC-ST-04-BB) contains the design basis spectra for the project and

II. DESIGN CONTROL OF SEISMIC RESPONSE SPECTRA (Continued)

is prepared in accordance with Procedure GQ3.04, entitled "Design Criteria," of the S&L Quality Assurance Manual. This procedure describes the quality assurance requirements for the preparation, review and approval of design criteria. Accordingly, controlled numbered copies of the Response Spectra Design Criteria are distributed to project personnel in the structural, mechanical and electrical departments within Sargent & Lundy and to Westinghouse Electric Corporation. Accompanying the transmittal of the document is a receipt form, which must be signed by the responsible engineer, who maintains his copy of that document, and is returned for file. All revisions follow this same transmittal procedure. Each recipient insures the appropriate spectra are used in design of all items within their scope including the use of proper spectra or seismic input in project specifications.

III. DESIGN OF NSSS SUPPORTS

Design of the Nuclear Steam Supply System (NSSS) Component Supports is a joint effort between Sargent & Lundy and Westinghouse Electric Corporation. All transmittal of information between Sargent & Lundy and Westinghouse is by formal correspondence with letters or reports. Stiffness characteristics of the supports as well as seismic information are provided by Sargent & Lundy to Westinghouse. If during the design process a significant change in support stiffness or seismic input occurs this information is forwarded to Westinghouse. Westinghouse performs the analysis of

III. DESIGN OF NSSS SUPPORTS (Continued)

the main coolant loop. The resulting forces reacting on the supports are transmitted to Sargent & Lundy. The forces used are documented in the project calculations for the supports and summarized in calculation design control summaries. A design control summary document summarizes the basis, input and methods of the design and provides for traceability of the development of the design calculations. Design adequacy of the supports is documented in accordance with ASME requirements by Sargent & Lundy in the Stress Report.

IV. DESIGN CONTROL OF PIPING ANALYSIS AND SUPPORT DESIGN

A. Description of Work

As a result of the changes in regulations, codes, and in particular, the issuance of I&E Bulletin 79-14, Byron stress analysis and support design has been entirely re-engineered. Work performed prior to December 1979 was redone or reviewed to verify that the analyses were consistant with the latest design input and consistant with the installation.

The CECo-Project Constuction organization provided as-built drawings to show the actual piping configuration and existing status of support installation. The subsystems requiring detailed computer analysis were sent to S&L with transmittals and were in the form required by project procedures. At S&L,

A. Description of Work

the engineering and design work was conducted in accordance with detailed procedures. The process included computer modeling and analysis, support design, nozzle load reconciliation, and multiple independent and supervisory reviews.

The design process for subsystems requiring simplified manual analysis was similar. S&L reconciled the as-built pipe routings with manual analysis and performed calculations for the 2-inch and smaller supports.

In order to perform this work, a project team was composed of Structural Engineers, Mechanical Design and Drafting personnel, Component Qualification Engineers, and Engineering Mechanics Engineers reporting to Project Engineers responsible for piping design and analysis. The volume and complexity of this work required that numerous technical and procedural instructions and manuals be prepared to insure adequate design control. These documents include those listed in Attachment A. In addition to these, several project procedures were prepared to give further amplification and direction. Checklists were developed to be utilized for coding, support design, and analysis.

B. Control of Design Changes

A field engineering crew was established to resolve problems that occurred during construction. Should a support installation problem occur during erection, the support was redesigned by the engineering field crew and an Engineering Change Notice (ECN) or Field Change Request (FCR) was issued. Any differences outside of specified tolerances between the actual support installation and the as-analyzed design were reconciled by either manual analysis at the jobsite or computer analysis at the S&L Chicago office. The field crew consisted of personnel from the same design disciplines as those performing the initial design work in the Chicago office and reported to a Mechanical Project Engineer.

Both administrative and technical procedures were prepared to control the field work. These documents include those listed in Attachment B.

C. Experience

Sargent & Lundy has been designing and qualifying piping and piping supports since the beginning of the nuclear industry. Piping has been designed, supported and qualified to applicable codes on operating nuclear plants such as Dresden, Quad Cities, Fort St. Vrain, Zion, and LaSalle, as well as many new plants under construction including Byron, Braidwood, Marble Hill, Clinton, and Zimmer. Throughout these years, Sargent & Lundy

C. Experience

has been building on its experience by developing better operational procedures and technical tools for analyzing piping systems. These advancements have been made in all the technical areas involved - piping analysis, pipe whip analysis, hydraulic transient analysis, finite element techniques, and heat transfer analyses.

One of the highest priorities has been the development of the technical staff in the Engineering Mechanics Group. They are degreed engineers, often possessing advanced degrees as well. Consultants have also been retained from both industry and the academic world to advise on special problems and to audit the technical methods. New employees are provided QA training and must pass an exam before being allowed to review work done by others. They are also given training and instructional materials that describe in detail the step by step procedures of piping analysis. Lectures on industry codes and piping analysis have been recorded on videotape and are given to new employees.

Finally, on the job training provides the engineer with needed experience. Close contact with an experienced engineer can teach the theories and practices that underlie the procedures and ensures that the procedures clearly defined in procedures and instructional materials are carried out.

C. Experience (Continued)

It is to these dual strengths of well developed technical methods and heavy emphasis on training that result in high quality work.

D. Design Review and Control

In order to insure that the engineering design process was performed correctly, a system of multiple reviews was built into the engineering design process. In addition, at the conclusion of the support installation for each subsystem, CECo-Project Construction will perform a final installation verification; and upon successful completion, a letter will be sent to S&L certifying that all supports were installed within specified tolerances of the design drawings. (As an alternate to the letter certifying all supports were installed within tolerances of design drawings, S&L will review installation information and update design documents to verify that installation is in accordance with design requirements.) At the Chicago office at S&L, this subsystem was again checked to insure that proper revisions of the drawings were installed and a review conducted to insure that all the supports had been designed and reflected the analysis.

The Various design manuals were all reviewed for consistency with the loading combinations in the FSAR and to insure that the combinations used were appropriate.

D. Design Review and Control (Continued)

Both technical and QA audits were conducted by S&L and CECo. An outside third party reviewer was also engaged to review the technical adequacy of S&L's analysis technique.

V. INTERFACE CONTROL WITH OUTSIDE ORGANIZATIONS FOR PIPING ANALYSIS AND SUPPORT DESIGN

A. General Description of the Scope of Work for Outside Organizations

Organizations outside S&L were and are being utilized for various tasks associated with piping analysis and support design on the Byron project. These organizations are basically of two types: technical and professional service contractors and vendors. Professional and technical service contractors work directly for and at the specific direction of S&L. Vendors provide their services to CECo, with S&L acting as the Owner's agent (as defined by the ASME), under the technical guidance outlined in a specification prepared by S&L.

The procurement of professional and technical services was controlled by established Sargent & Lundy procedures which ensure that QA requirements were applied for those contractors involved in safety-related work. Nuclear Power Services of Secaugus, New York, has been involved in the analysis and

A. General Description of the Scope of Work for Outside Organizations (Continued)

support design of safety-related and non-safety related piping systems. The interface controls utilized by Sargent & Lundy are described in subsection V.B.

One vendor is involved in the piping analysis and support design process. Westinghouse of Monroeville, Pennsylvania, the NSSS supplier, was responsible for the design of the reactor coolant system piping, the reactor pressure vessel and internals, as well as the analysis and support design of numerous safety related and nonsafety related piping systems. This interface was delineated in an interface agreement prepared by Westinghouse, reviewed by S&L and CECo and signed by Westinghouse, S&L and CECo (see attachment C). This interface is described in more detail in subsection V.C.

B. Nuclear Power Services

The magnitude and schedule of the piping analysis and support design work was such that S&L employed an outside consultant, Nuclear Power Services (NPS), to perform a portion of this design work. NPS was provided with all the required documentation and controlling procedures that S&L used in addition to a detailed design specification for the work. Procedures prepared by Nuclear Power Services were reviewed by S&L for acceptability and consistency. Meetings were held to

B. Nuclear Power Services (Continued)

discuss NPS and S&L design and analysis. Technical and QA audits were conducted by S&L, CECo and NPS. Frequent trips were made to the Nuclear Power Services site offices for the purpose of resolving technical issues, insuring consistency and monitoring status. The technical basis of the work performed by NPS is identical to that performed by S&L.

A letter from A. Stone of Nuclear Power Services Corporation to D.L. Leone of S&L data April 8, 1983 detailing Nuclear Power Services design control is attached.

C. Sargent & Lundy Interface with Westinghouse

The interface between Westinghouse and Sargent & Lundy (S&L) required the exchange of a vast quantity of information. This exchange was controlled by utilizing letter identification systems for both letters from S&L to Westinghouse and letters from Westinghouse to S&L. Letters from S&L to Westinghouse were identified using a system that consisted of a letter prefix (SLE, SLM, SLWC) followed by a sequential number. The SLE prefix identified the letter as originating from the Electrical Project Engineering Division, while the SLM prefix identified the letter as originating from the Project Management Division. A log containing the letter number, letter date, the originator, and a brief description of the letter's content was maintained by Sargent & Lundy. Letters from Westinghouse to S&L were

C. Sargent & Lundy Interface with Westinghouse (Continued)

identified using a system that consisted of a letter prefix (CAW, CBW, or CAW/CBW) followed by a sequential number. The CAW prefix identified the letter as applicable to Byron Station, the CBW prefix as applicable to Braidwood Station, and the CAW/CBW prefix as applicable to both stations.

The "CAW/CBW" transmittal letters were used for submittal of equipment specifications, system standards, drawings, design changes, instruction manuals and all other design information. Documentation transmitted with these letters involving S&L and Westinghouse interface were distributed for review within S&L in accordance with a project distribution list. Comments were compiled and returned to Westinghouse via a "SLE/SLM" letter requesting resolution of the comments.

The "CAW/CBW" letters and "SLE/SLM/SLWC" letters were also used to exchange regular correspondence between S&L and Westinghouse. S&L correspondence to Westingouse was controlled by the respective responsible engineer within the project group and filed in accordance with the project file index. Westinghouse correspondence to S&L was addressed to the Project Manager and distributed to the appropriate S&L personnel in accordance with a project distribution list. These Westinghouse letters were also filed in accordance with the project file index.

C. Sargent & Lundy Interface with Westinghouse (Continued)

Other methods which ensure proper interface between S&L and Westinghouse are frequent meetings between senior level and lower level personnel and frequent telephone contract between the Westinghouse project personnel and the S&L responsible engineers. Selected meeting notes and telephone conversation memoranda have been filed in accordance with the project file index. Examples of meetings between CECo, S&L and Westinghouse were the NSSS system design meetings, balance of plant (BOP) interface meetings, site engineering/construction/operations meetings, and many other special meetings, the results of which were documented in the meeting notes. In addition, the Westinghouse project manager attends the regularly scheduled monthly status meeting at the Byron site.

The methods of interface design control with Westinghouse are discussed in four phases, as follows:

a. Westinghouse inputs to Sargent & Lundy
b. Sargent & Lundy Inputs to Westinghouse
c. S&L Review of Westinghouse Design Criteria and Design Specifications
d. Review of Westinghouse Stress Reports and Design Reports

D. Westinghouse Inputs to Sargent & Lundy

Westinghouse provides a broad spectrum of design input to Sargent & Lundy on a variety of NSSS design aspects. These provide a major piping interface design control tool to Sargent & Lundy. The list below provides a few examples of the Westinghouse input.

a. Systems design information including P&ID's design criteria puping design tables and equipment specifications.

b. Allowable nozzle loadings on equipment

c. LOCA forces and moments for support and embedment design

d. Physical drawings of NSSS equipment showing interface connections and mounting details

E. Sargent & Lundy Input to Westinghouse

The input supplied by Sargent & Lundy to Westinghouse included that required to perform LOCA and seismic analysis for the Westinghouse scope of design. Included in the input are seismic response spectra, NSSS support stiffeners, seismic acceleration time histories and mathematical models of the internal structures of the containment which support the NSSS. All this information was formally transmitted with letters, reports, and in the case of the seismic response spectra, through transmittal of the response spectra design criteria.

F. S&L Review of Westinghouse Design Criteria and Design Specifications

A very important consideration in the dynamic loads program was load combination. Westinghouse design crtieria and design specifications provided the load combinations, as well as referencing the design basis loads that were to be utilized in their analysis of the RPV and internals, mainsteam piping and feedwater piping. These documents also outlined the general analytical approaches to be undertaken by Westinghouse.

These Westinghouse documents were submitted to S&L via the "CAW" letter system and were distributed to the appropriate Byron project team members for review and use. Comments on these documents were forwarded to Westingouse and resolved by letter. Revised documents were issued if required.

G. Review of Westinghouse Stress Reports and Design Reports

As the final step in the control process, the final Westinghouse output documents, as part of the "CAW" letter system in the form of stress and design reports, were reviewed by an independent group at Westinghouse as the Onwer's agent (as defined by the ASME). They were reviewed by the appropriate project team disciplines, and comments were returned and resolved via letter. The documents were revised and resubmitted, if required.

VI. CONCLUSION

The description of the routine S&L QA Program controls has been described briefly. The statement describes how once the proper distribution was assured that very careful attention was given to assuring that the interfacing groups receiving the information were instructed on its proper application. The statement describes how the structural response spectra was forwarded to the interfacing S&L departments and organizations external to S&L to insure that all plant components and analyses were actually assessed to the correct response spectra.

It is through the design approach described, including the preparation of very detailed procedures, together with the use of detailed check lists by the Project Team Members implementing procedures that S&L is confident that the Byron Plant has been adequately designed.

ATTACHMENT A

LIST OF TECHNICAL AND PROCEDURAL INSTRUCTIONS AND MANUALS

PROJECT INSTRUCTIONS (PI)

PI-BB-14	Procedure Defining the Inter and Intradepartmental Interface and Information Flow Required for Piping Analysis and Component Support Design
PI-BB-15	Component Support Design
PI-BB-16	Formal Piping Analysis and Component Support Design
PI-BB-26	Procedure for Preparation and Submittal of Piping "As-Built" Information
PI-BB-27	Receipt, Review, Reanalysis (Where Applicable), Redesign (Where Applicable) and "As-Built" Piping Reconciliation
PI-BB-34	Documentation of Hanger Loads
PI-BB-38	Pipe Whip Restraint Analysis, Design and Review

Manuals

Lesson Plan for Training Personnel In Piping Analysis

Byron/Braidwood Unique Design manual

Review and Documentation of Pipe Welded Attachments Standard Design

ATTACHMENT B

LIST OF TECHNICAL AND ADMINISTRATIVE PROCEDURES
TO CONTROL FIELD WORK

BYRON FIELD INSTRUCTIONS (BFI)

BFI-1	Preparation of Byron Field Instructions
BFI-2	Project Instruction Training
BFI-3	Assembling Documents and Drawings
BFI-4	Resolution of hanger Field Problems
BFI-5	Transfer of Mechanical Mylars to the Byron Site
BFI-6	Preparation and/or Revision of Design Drawings
BFI-7	Processing of Core Drill Requests (COR's)
BFI-8	Processing of Byron FCR Originals
BFI-9	Aperture Card Filing and Retention
BFI-10	Procedure for Electrical As-Built Drawing Release

PROJECT INSTRUCTIONS

PI-BB-23	Byron/Braidwood Electrical Field Personnel
PI-BB-28	Activities of the Byron/Braidwood Station Piping/Support/Analysis Field Personnel
PI-BB-29	Distribution and Control of Design Documnts for S&L Field Personnel at the Byron/Braidwood Stations
PI-BB-30	HVAC Ductwork Seismic Support Design Verification
PI-BB-32	Organization of S&L Personnel Assigned to the Field
PI-BB-37	Documentation of Cored Holes and Cut Reinforcing Steel

ATTACHMENT C

WESTINGHOUSE INTERFACE AGREEMENT